133 As one goes inland from the coast and westward through Yaruro territory, the land slowly rises so that the town of San Fernando de Apure is about 100 feet above sea level; Palmarito de Guachara, about 60 miles southwest, is just 145 feet; and the Cinaruco river about 100 miles SSW is about 190-200 feet. From the middle Cinaruco, the site of the writer's field work, to the sea, the average slope is 0.007% or 4 ½ inches/mile, but the slope increases gradually as one goes west till nearly 200 miles to the west, the plains abut on the Andes where, within a space of about 50 miles, the land rises from about 650 feet to over 12,000.

132 The slope of the land is paralleled by a gradual increase in total annual rainfall and length of rainy season, respectively averaging for the region as a whole about 1600 mm (63") annually,[1] and about 5 months of heavy rains with 2-3 transitional months of unsettled weather with considerable rain. The slope and climatic gradations are paralleled, furthermore, by an ●134 orderly series of soil and vegetation types. As one moves steadily nearer the mountains, the soils change from muds, as at San Fernando, to muddy and sandy loams at Guachara, to sands and sandy loams in the central Cinaruco, and increasingly to sands and pebbly areas. These micro-ecological [184] differences appear to determine micro-cultural differences among various groups of Yaruro as one goes westwards, for example in the specific content of the cosmology. Space only permits us, here, to deal with the Cinaruco area.

133 The dip of the strata, hence drainage, is from West to East. The slope of the dip is so small, as we have noted, that at the first sizable rains, the flow exceeds the carrying capacity of the stream beds and flooding occurs. Thus, during the rainy season from May through September, [132] during which from 85-90% of the annual rain occurs, there is a constant tendency to flood, while during the driest months from December through March, not more than a total of 3 inches falls, and the rivers and landscape dry up often totally, presenting desert-like conditions. Because the topography of the central Cinaruco area is not level in large areas, and even in the flat parts, is raised above the level of the streams, flooding occurs more because of accumulated rain in low spots where it cannot drain than from overflow from streams. The streams themselves are swollen and in places overflow their banks for short distances before they are enclosed by the higher terrain. The west-east dip of the land an the east-west prevailing winds combine to make surface land forms, such as sand dunes and creeks, called *caños* (Y. *doro)* run east and west also.

133 In the central Cinaruco area, the creeks on the north side of the river 137 are contained in a sort of basin formed by a row of dunes, perhaps as high as 100 feet above the neighboring savanas, almost 300 feet above sea level, running east and west for many miles at a distance of 3-5 miles from the Cinaruco. On the south side of such "ranges" of dunes, a creek like the Totúdoro is likely to be found. On its right bank, sometimes at some [134] distance back from the normal high water mark, it is contained by the edge of the flat, sandy, coarse-grassed savana, which is marked by a continuous

1 [for footnote see category 116, p. 42 --Analyst]

narrow band of soft, red-brown, heavy pebbles, sometimes agglomerated into chunks as large as a man's head. These, the only stones of this area, are entirely absent to the north-east and are technologically useless. Between these bands, which appear to represent flood levels or banks of older streams into which the present beds have been incised, and the streams themselves, low-lying areas are found which are soggy to a depth of a couple of inches above a clayey-sandy hardpan, and are covered with a sleezy layer of organic remains. Grasses appear slightly less barren here than in the areas beyond the pebble banks, the savanas proper.

The savanas run east-west for miles and may be one or more miles wide, broken here and there by either strips of dunes or patches of woods, called *montes* (Y. *hõi*), growing in somewhat saucered hollows which may once have been parts of stream beds. On the upper level savanas (Y.*ciri*), the soil is largely sandy, with occasional scatterings of pebbles at the juncture with the lower savana level 12 to 15 feet below it. Grasses are course, tough, long-rooted, and sparse, giving a barren, yellow appearance even in mid-rainy season. Only a few scrubby trees are seen on the open moors, mostly in wetter spots. These sandy savanas have long since been leached of practically all mineral content, as soil tests show.[2] The savanas constantly tend to lose their finer particles of soils, which are deposited near the streams where the latter have cut down a few feet into the surface of the savana. Thick and rich soil layers are thus created. It is in such layers that soils mechanically more suitable for horticulture combine with a water supply which suffices not only in the wet season, but also provides a dry-season water table accessible to long-rooted flora. This combination fosters the growth of gallery forests, here, which constantly add humus to the very limited areas of better soils provided in this habitat. The width of these layers depends on the depth of the stream's incision and the amount of flow as well as on the presence and relative distance of the dunes and the high and low savanas from the streams, and on the slope and width of the low savana next to the stream. Maximum width of these layers occurs where the streams are more incised and the slope from the higher savana to the streams is a steady descent, so that drainage occurs without flooding and waterlogging, while the dry-season water-table is not too far below. Under any other conditions, these places are narrow, or may almost disappear. Thus, the mouths of *caños* have narrow or no strips of gallery forest since the level of the savana is little above that of the stream, and little soil accumulates at the same time that flooding is heavy. On the upper reaches of streams, *caños* are little incised, the slope from the high savana is insufficient to have deposited much soil, and the forest again disappears. Thus only the median stretches of streams are well-forested and it is only in these areas that horticultural soils are available. Only the *montes*, those depressions in the savana surfaces, which, though above permanent water, nevertheless are nearer the water table than the surrounding savana, provide other suitable, if dry, areas for planting. Here too are found tall tropical hardwood forests which somewhat enrich their own soils by a very thin layer of humus.

[2] [for footnote see category 116, p. 42--Analyst]

241 With respect to these habitat conditions, the single most important, and, in the case of the Yaruro, predominant subsistence activity is swidden-ing, also called brand tillage, slash and burn horticulture, milpa, or shifting horticulture, a type of subsistence which peoples in both tropical and temperate forested areas of the world have practiced and still practice widely. The procedure followed by the Yaruro is very much like that of other swiddeners.[A] A garden site is chosen in virgin forest or preferably in second growth. During the dry season, the underbrush is first cut out and then the larger trees are felled by a variety of techniques including the use of machetes, axes, or girdling. The cut trees and brush are left to dry during the remainder of the dry season. Just as the first rains are approach-ing, these logs, along with whatever smaller underbrush may be standing, are set afire. The smaller materials largely burn up while the charred remnants of large trees lie scattered about. Burning partially destroys the [134] humus, as does removal of the forest cover, and to a degree disturbs the soil structure,[A] consequently often speeding the decline of soil fertility despite the addition of organic material from the rotting of partially burned tree boles. Also ash from the burned wood contributes some fertilizing minerals to the soil, thus increasing the short-term fertility of the soil before it is exhausted by man, plants, and rain.

134 241 The destruction of the forest cover and of the humus layers exposes the plots to more drastic leaching or erosion by tropical rains. This fact, together with a decrease in fertility from continual replanting and harvesting in unweeded and uncultivated soils, accompanied by a gradual but drastic invasion by weeds and grasses, makes further use of the plot uneconomical at best and impossible at worst. It is abandoned in favor of some entirely new plot or one which has been reconstituted by long fallowing. Abandoned plots overgrown by weeds and grasses, though they may soon recover their fertility, are so difficult to work with the characteristic swidden horticul-tural tools,[A] the digging stick and the machete, that they generally cannot be recultivated until a new forest cover has grown up and shaded out smaller vegetation. This usually takes a number of years, in general a minimum of 10 to 15 years, though, in other parts of the world this range may be extended in both directions.[A]

241 Planting is carried out beginning just before or just at the inception of the rains and just after the burning. It may be continued at intervals during the rainy season in order to stagger the harvests. Plantings may be staggered through part or all of the dry season, if climate and horticultural conditions permit, to create a more or less continuous crop, and the probability of a correspondingly higher annual productivity per capita and per land area. Where marked differences between seasons are not found, the entire process may be more or less continuous throughout the year. Irrigation, terracing, and fertilization (other than natural fertilization resulting from silting) are not used.

311 The remaining land surface presents resource areas of various types. In passing, it should be noted, though it is too often thought to be self-evident and consequently not specified, that what constitutes a resource

[A] 3,4,5,6 [for footnote see category 116, p. 42--Analyst]